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The CHIIA Data in Comparative Perspective

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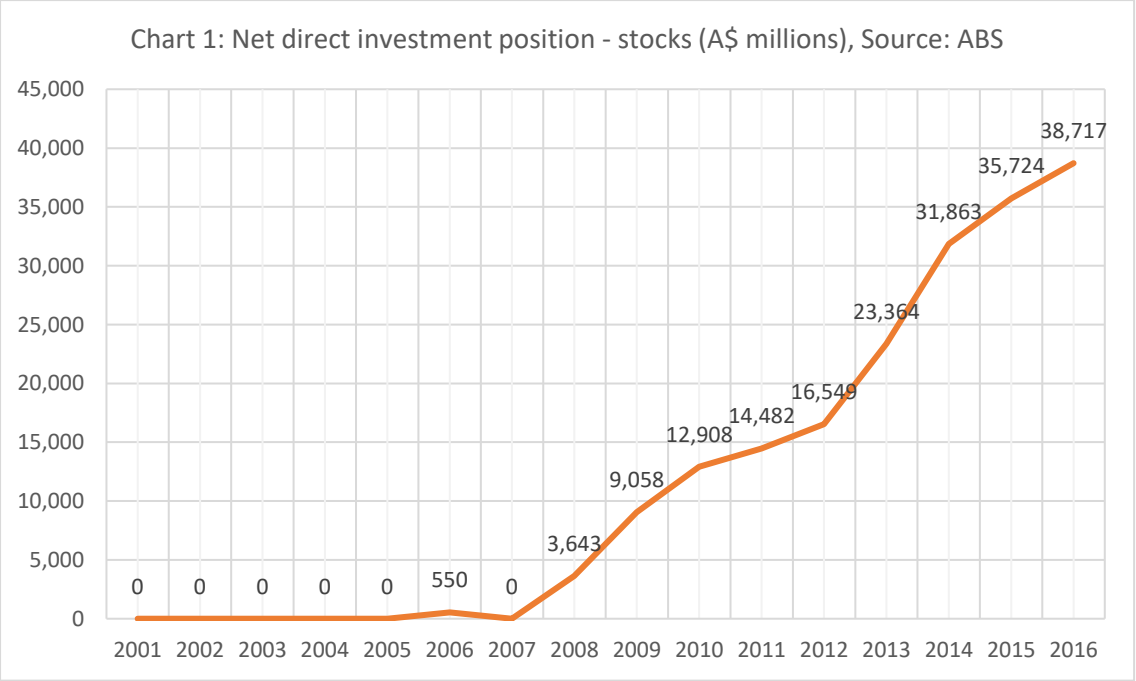
Abstract

This paper explains the information gap filled by the Chinese Investment in Australia Database (CHIIA). While there are other sources of data on the realisation of Chinese direct investment in Australia, no other source publishes transaction-level data that is classified by ultimate beneficial control and date of realisation. To better understand how CHIIA relates to data on other aspects of Chinese investment in Australia including foreign investment approvals data, the concept of an 'investment pipeline' is developed. This pipeline helps explain why different data sources report very different annual figures. This paper addresses the question 'What does CHIIA data tell us about Chinese investment in Australia, that we didn't know before?'.

I. Introduction

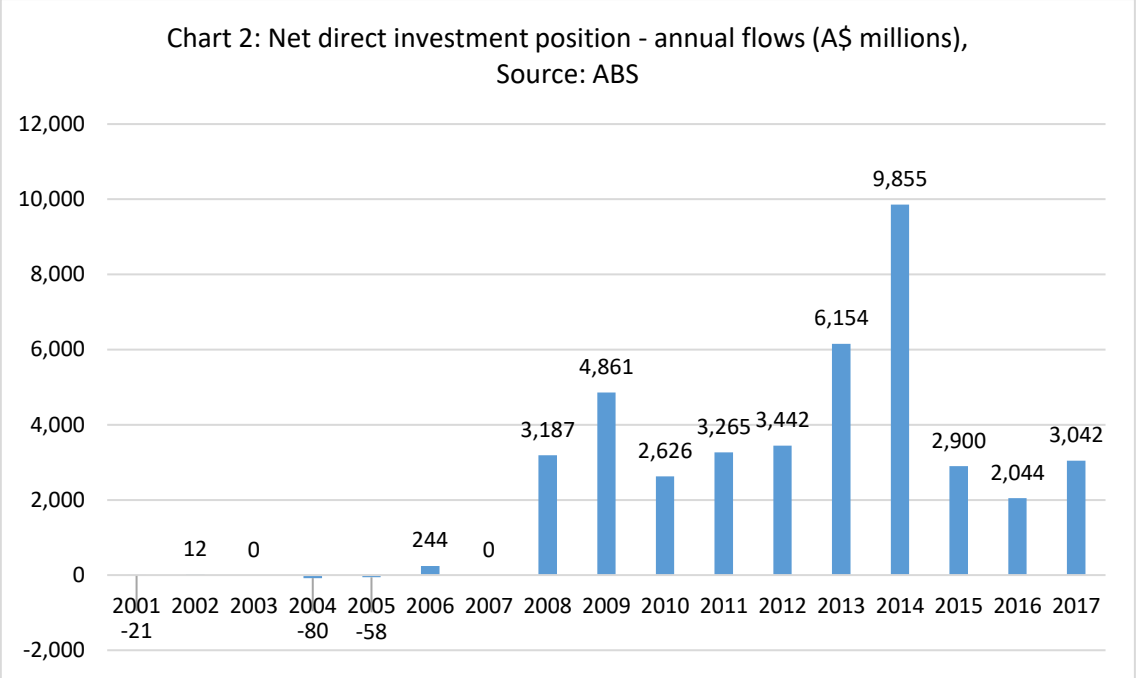
The stock of Mainland Chinese ('Chinese') direct foreign investment in Australia has been growing since 2008 (Chart 1). The stock of investment recorded by the Australian Bureau of Statistics (ABS) can be thought of as a 'footprint' of Chinese investment in Australia. It is net of divestment, and includes debt and the changing value of ongoing holdings. It is the core measure of the ongoing value of Chinese investors' direct investment holdings in Australia[1].



To better understand how this investment stock was accumulated, consider the yearly flows recorded by the ABS (Chart 2)[2]. The chart that shows the value of Chinese investment has been increasing every year since 2008, although the rate of increase has varied considerably.

[1] Note: all dollar values are nominal and are recorded in A$ millions, unless stated otherwise.

[2] It is important to note that the total stock is not simply the sum of annual flows, as the stock also varies with for price changes and other adjustments. In balance of payments, statistics, undistributed income (reinvested earnings) is included as a flow, see IMF, Balance of Payments Manual, Sixth Edition, IMF, pp123, 183.



The ABS data provides a comprehensive measure of the investment it records. However, it is unlikely that the ABS records all direct investment originating from mainland China. The methodology used to produce ABS data[3] defines investment by the country of 'immediate origin'[4]. For example, if funds pass through another country or territory between leaving mainland China and arriving in Australia, then those funds would be recorded as investment from this source not from China in the ABS data. The alternative to record investment by 'immediate origin' is 'ultimate origin', which defines investment by the country of ultimate beneficial control. The ultimate origin approach effectively ignores whether the funds or ownership pass through another country or territory between China and Australia, and only focuses on the location of the party controlling the funds and the location of the entity ultimately receiving investment.[5]

Several data sources measure Chinese investment by ultimate origin. These data provide a complementary account to the ABS data, but making accurate comparisons between the different data series can be difficult. Many of these other data sources have additional methodological differences, or are measuring different activity from ABS data on direct investment.

This paper provides a framework within which to compare the data from all these sources. First, the different kinds of investment activity will be explained and the relationships between these activities will be defined. Second, a reconciliation of the data sources, including CHIIA, which captures the equity acquisition aspect of direct investment will be provided. This reconciliation shows how CHIIA data adds useful information about the current environment.

II. The investment pipeline

The pipeline of Chinese investment inflows to Australian, by definition, begins in China and ends in Australia. This pipeline is conceptualised as a sequence of seven stages, shown in Table 1. Table 1 provides a representation of the simplest case. Later in the discussion of how each stage relates to

[3] IMF Balance of Payments Manual, version 6

[4] This concept will be further explained in section III

[5] For a general discussion of direct investment relations see IMF Balance of Payments Manual version 6 Chapter 6 and for more complex direct investment relations see OECD Benchmark Definition of Foreign Direct Investment.

the other, several variants of the pipeline will be considered. This discussion reflects the fact that not every investment will proceed through each stage in this order and not every investment will proceed through every stage.

In the simple case of the investment pipeline, a single equity investment (that establishes a direct investment relationship[6]) is considered . It is assumed that equity investment approvals are required, the planned investment is realised and there is follow-on investment (also termed 'development').

In this case, the investment pipeline begins with planned investment (Table 1, Stage 1). The Chinese investors will then make an agreement with the previous investor/s to acquire an equity holding in an Australian entity or establish a new entity in Australia (Stage 2). Between agreeing to acquire the holding and the change in or establishment of legal ownership, approval/s are granted for the equity investment (Stage 3). These approvals include foreign investment approvals from the Australian government, Chinese government approvals and other approvals required for the equity holding to be acquired (for example, shareholder approvals). The initial investment could also be conditional on further approvals including approvals from state governments or a local council for building and land use as well approvals from environmental protection agencies. Once an investor gains relevant approvals for the equity investment, it can proceed to acquire the equity holding (Stage 4). The Chinese investor can then choose to further invest in the operations of the entity through debt or other commercial finance instruments. To do so they will need to receive relevant approval/s from Chinese and Australian government agencies for follow-on investment (Stage 5). Upon the relevant follow-on approvals being granted, the investor makes the follow-on investment in the entity of the equity holding (Stage 6). Subsequently, the value of the entity can change (Stage 7). This change can occur through domestic savings or undistributed profits, revaluations or other changes.

To understand this pipeline and its many possible variations fully, information about each stage is needed. The 'Data' row in Table 1 notes the principal sources of data on each stage. All stages except Sections 1 and 5, have some coverage by at least one data source.

Some of these data are public and some are private. All data held by the ABS and Sydney-KPMG are private, but selected aggregated statistics are public. In this paper, the discussion draws on the public information from each source. This limits comparisons between sources.

[6] A direct investment relationship is established when a foreign entity takes an equity holding in an Australian entity that accounts for at least 10 per cent of the ordinary voting stock (or equivalent) in the Australian entity, or a stake that establishes significant influence.

The Pipeline of Chinese Direct Investment in Australia

Table 1: Investment pipeline and data collected

Stage	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Description	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding	Change in value of entity
Data source	-	- Sydney-KPMG[C]	- FIRB [P]	- ABS [P,C] - Tracker [P,C] - **CHIIA**	-	- ABS [P,C] - Tracker [P,C] - Sydney-KPMG[C]	- ABS [P,C]

[P] = Partial coverage
[C] = Composite figure

III. A. Scope of data sources noted in the Investment Pipeline (Table 1)

There are additional sources of data which provide information on the investment pipeline, which are not analysed here. For instance, statistics from the Chinese Ministry of Commerce (MOFCOM), which tracks outbound Chinese investment. The current version of the pipeline focuses on investment from a receiving-country perspective (Australia in this case). The statistics used are from Australian sources.

The Foreign Investment Review Board Annual Reports ('FIRB')

The FIRB collects data on the Australian Government foreign investment approvals and notifications it is required to review on behalf of the Treasurer (Stage 3). When making foreign investment decisions, the Treasurer is advised by the FIRB. Stage 3 is broad. It includes all required equity approvals (not just Australian Government foreign investment approvals). As such, the FIRB data provides partial coverage of this stage for two reasons.

First, not all Chinese investment in Australia is required to notify or obtain Australian Government foreign investment approval. Whether Australian Government approval is necessary depends on a number of factors including, but not limited to: whether the investor is a foreign government or non-government investor; commitments under Free Trade Agreements (FTAs) on investment value thresholds; the entity receiving investment; and the sector this entity operates within.

Second, the FIRB data has complete coverage of the approvals the Treasurer reviews. However, the FIRB does not publish data on the other necessary approvals (for example, Chinese government approvals) that do not fall within the Australian Treasurer's purview. Hence, FIRB data has partial coverage of Stage 3 of this pipeline, as noted in Table 1.

The Australian Bureau of Statistics ('ABS')

The ABS records data on realised investment that is received directly from mainland China and reinvested earnings of direct investment enterprises operating in Australia. As the ABS does not record Chinese investment which comes to Australia via a third-party country or territory (as being Chinese investment), its coverage of investment ultimately owned by mainland Chinese entities is partial. ABS data is the sum of data collected on Stages 4, 6 and 7. Thus, the published statistics are noted as being a composite, in Table 1.

The China Global Investment Tracker ('Tracker')

The China Global Investment Tracker ('the Tracker') publishes transaction-level data on outbound non-bond Chinese investment involving at least US$100 million. As it does not include smaller value investments, it has partial coverage of the stages it covers. Being 'non-bond' investment, this source also includes investment through loans and other non-bond sources. These flows may coincide with the equity flow or occur as 'follow-on' investment. As it also includes investment that is above the value threshold, an equity holding of less than 10 per cent, which is the standard threshold for a direct investment relationship, would be included. While the published data is at the transaction level, non-equity investment is recorded in the same aggregate as equity investment. It is therefore a composite figure of stages 4 and 6.

The University of Sydney-KPMG Demystifying Chinese Investment in Australia Database ('Sydney-KPMG')

Sydney-KPMG records Chinese direct investment deals in Australia involving at least A$5 million. Sydney-KPMG applies the standard IMF definition for a direct investment transaction, including equity and some other non-equity investment. It does not include reinvested earnings.

Sydney-KPMG appears in two parts of the timeline because it records more than one component of direct investment. It first appears in Stage 2 because in each annual report, new figures are provided for Chinese direct investment deals signed by the date of contracting, for the preceding year.

It could also appear in Stage 4 because in later annual reports these figures are updated to reflect the changes caused by investment that were not realised. These figures also sometimes increase, which reflects new information that becomes available – a pattern common to all data sourced primarily from public information.

It next appears in Stage 6 because the annual figures include some non-equity investment.

For the purpose of this analysis, Sydney-KPMG will be discussed in relation to Stage 2 but not Stage 4 or 6. This is because Sydney-KPMG was intended to be a source of data on deals, not realised investment. As the only possible source of data on deals, this interpretation maximises the information available on Chinese investment in Australia. It should be noted that this interpretation requires using the highest figures reported for each year[7]. It should also be noted that some portion of these aggregate figures includes deals incorporating non-equity investment.

The Chinese Investment in Australia Database ('CHIIA')

CHIIA records the equity component of Chinese direct investment in Australia, with no lower bound on the transaction value. This means it has full coverage of Stage 4. Like Sydney-KPMG and the ABS, CHIIA uses the standard definition of direct investment, but only records the equity component. As noted (see section II. E.), the application of the direct investment definition is not confined to cross-border transactions as is ABS data, but can include transactions establishing a direct investment relationship between Australian resident enterprises, where the investing firm itself is a controlled or effectively-controlled subsidiary of a Chinese firm.

[7] The highest figure reported by Sydney-KPMG should provide the best approximation of the value of deals signed, given available information. Sydney-KPMG figures can fall after the initial report because Sydney-KPMG removes unrealised deals. The figures can also rise because more information is sometimes available well after the initial report, at which time the relevant investments are added at the contracting date. It is noted that the highest figure is an approximation because there could be both subtractions and additions in subsequent years.

II. B. Understanding the Investment Pipeline

To understand the high-level relationships between each section of the pipeline, the relative values of investment expected across each stage are considered. To begin with, there is no consideration of different size of values.

In this simple case, the planned investment is assumed to be realised. It is also assumed that approvals are required and the follow-on investment is realised. This implies positive values recorded across all stages. Stage 1 is defined as the sum of Stages 4 and 6 (assuming all plans are realised at the initial valuation); Stages 2, 3 and 4 are defined as being equal (again assuming what is approved is realised in an equity flow, only). The change in the value of the entity (Stage 7) is difficult to determine. It is affected by many exogenous factors (for example, market and asset valuation changes) and the investment under consideration. Stage 7 from Table 1 is not included in Table 2 or this analysis. While it is crucial to a full understanding of Chinese investment in Australia and its full economic impact, it is very difficult to confidently establish a relative value from the firm-level data available.

In this simple case, the assumption is made that equity approvals are required. Not all Chinese investment requires equity approvals. Thus, the pipeline distinguishes between the case where equity approvals are required 'Investment requiring equity approvals' and the case where equity approvals are not required 'Investment not requiring equity approvals', shown in Table 2.

Table 2: Pipelines for investment depending on requirements for equity approvals

Cases	**1**	**2**	**3**	**4**	**5**	**6**
Investment requiring equity approvals	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
Investment not requiring equity approvals	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding

It is possible that investments which require equity approvals do not receive approval[8]. This is included in the case shown in Table 3. There are two situations in which this occurs. The first is 'Investment requiring equity approvals – agreement and no approval', when the Chinese investor has entered into an agreement to acquire an equity holding that is conditional on obtaining equity approvals, but does not obtain approval. The second is 'Investment requiring equity approvals – no agreement and no approval', this is when the foreign investment application is required before an agreement can be made to acquire an equity holding (for example, it is a requirement to lodge a bid), and equity approvals are not obtained.

[8] In reality this has occurred rarely. Only five foreign investment approval applications have been rejected since 2001.

Table 3: Unsuccessful equity approvals

Cases	1	2	3	4	5	6
Investment requiring equity approvals – agreement and no approval	Planned investment	Agreement made to acquire equity holding in Australia				
Investment requiring equity approvals – no agreement and no approval	Planned investment					

To consider the implications of the pipelines in Tables 2 and 3 on the data recorded by the FIRB, the scope of equity approvals will be temporarily constrained to only include Australian Government foreign investment approvals. Table 2 suggests that the value of investment approved by the Treasurer could be lower than value recorded in sections 4 – 6 because not all investments require foreign investment approval. However, the figures reported by FIRB are much higher than any source recording data in Section 6. This suggests that not all investment approved by the Treasurer is realised (including the case where multiple approvals on the same project are provided and only one proceeds). There are two situations in which this can occur.

The first situation is when an agreement to acquire the equity has been made and equity approvals were gained, but the investment was not realised. There are many possible factors that prevent realisation, including commercial factors as well as the possible requirement of approvals from other government agencies (such as planning and zoning, and environmental approvals) or foreign government approvals. These are not explored in this paper but are grouped together as 'exogenous factors'.

The second situation is that although there was no existing agreement to acquire the equity, equity approvals were actually obtained, but the investment was not realised. This situation can occur when a Chinese investor is bidding to acquire an entity and obtaining equity approvals is a requirement to lodge the bid, but the bid is subsequently unsuccessful. As noted, there can be multiple Chinese bidders who all require approvals to bid, thus the FIRB data captures the combined value of multiple (competing) approvals. This case is shown in Table 4 (third row, outlined in bold).

Table 4: Unrealised investment for both cases of equity approval requirements

Cases	1	2	3	4	5	6
Unrealised investment not requiring equity approvals	Planned investment	Agreement made to acquire equity holding in Australia				
Unrealised Investment requiring equity approvals – exogenous factor	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment			
Unrealised Investment requiring equity approvals – unsuccessful bid	Planned investment		Approval/s granted for equity investment			

It is a condition of the pipeline that an direct investment equity holding must be acquired for follow-on investment to occur. However, the acquisition of an equity holding in an entity does not mean follow-on investment will necessarily occur. Each of the cases of 'follow-on investment' and 'no follow-on investment' are shown in Table 5.

Table 5: Follow-on and no follow-on investment

Cases	**1**	**2**	**3**	**4**	**5**	**6**
Investment requiring equity approvals (with follow-on)	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
Investment requiring equity approvals (no follow-on)	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	
Investment not requiring equity approvals (with follow-on)	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
Investment not requiring equity approvals (no follow-on)	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	

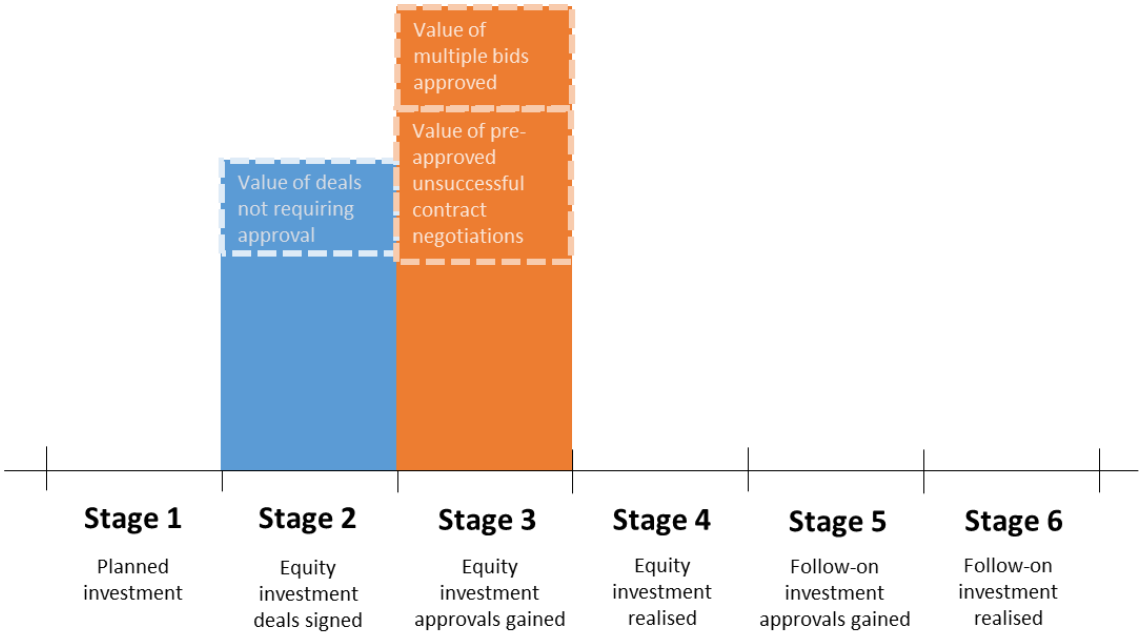
II. C. Relationships predicted by the pipeline

Five expected relationships between the levels of investment recorded by each data source can be deduced from the investment pipeline.

1. **Planned investment (Stage 1) should be higher than all other stages.** If there is any unrealised planned investment, planned investment (the sum of planned equity and follow-on investment) should be higher than equity investment deals signed (Stage 2). If there is any planned investment that does not complete Stage 2, or does not gain the necessary equity approvals, planned investment (Stage 1) should be higher than equity investment approvals (Stage 3). This 'survival function' logic applies to later stages as well.

2. **If equity deals signed (Stage 2) figures are lower than equity investment approvals (Stage 3), then the value of bids that do not become signed deals is higher than the value of deals not requiring approval.** Because not all Chinese investment requires equity approvals, figures on equity approvals (Stage 3) should be lower than those on equity investment deals signed (Stage 2). However, if multiple bids for the same asset receive equity approvals, or single bids are pre-approved but contract negotiations are unsuccessful, then the value of equity approvals should be higher than equity deals signed. If we assume both are true, the net difference of the two effects will determine whether Stage 2 or Stage 3 is higher. Chart 3 shows the case where the value of multiple bids and pre-approved but unsuccessful contract negotiations, is greater than that of deals not requiring approval.

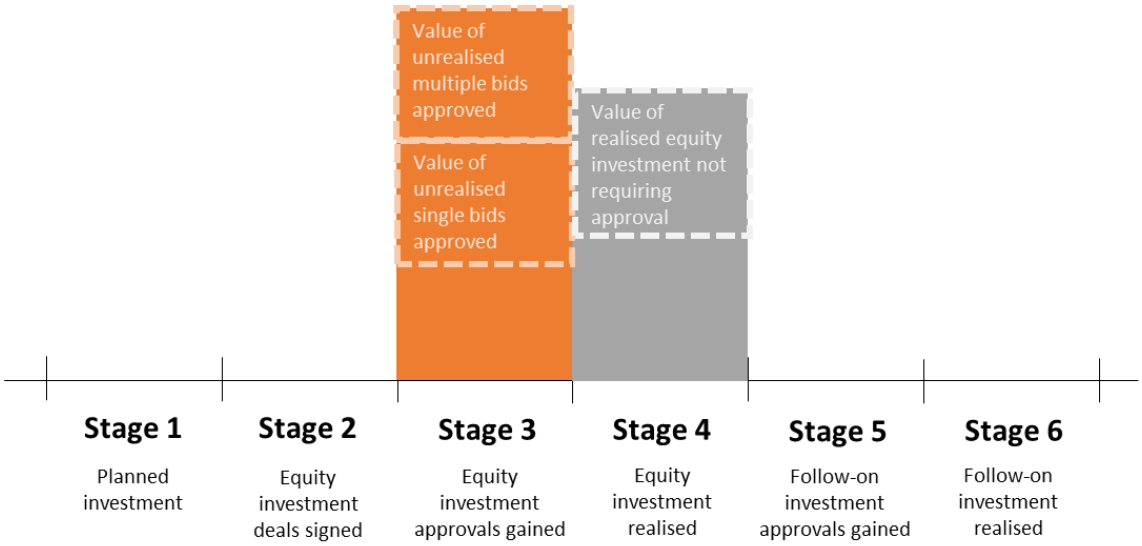
Chart 3: Second expectation from pipeline



3. **If equity approvals (Stage 3) figures are larger than equity investment realised (Stage 4), then the value of unrealised equity approvals is greater than the value of realised equity investments not requiring approvals.** Not all Chinese investment is subject to equity investment approvals, which suggests stage 4 figures should be higher than stage 3. Not all approvals may be realised. This may be because multiple Chinese investors' bids for one

asset are approved, or single Chinese investors' bids are approved but are not realised. The case where the value of unrealised approved investment is larger than the value of realised equity not requiring approvals, is illustrated in Chart 4

Chart 4: Third expectation from pipeline



4. **If equity deals signed (Stage 2) figures are larger than equity investment realised (Stage 4), then there must be some signed deals which are not realised.**

5. **If follow-on approvals (Stage 5) figures are larger than equity investment realised (Stage 6)**, **then the value of unrealised equity approvals is greater than the value of realised equity investments not requiring approvals.** The same reasons are relevant here as in respect of the third expectation.

This understanding is grounded in a firm-level perspective of investment — the steps that a Chinese investor has to take in the process towards investing in Australia, in different circumstances. In reality, not all steps are applicable to all investors or investments. This is illustrated in the pipeline by including these cases. The cases, however, do not represent investments that complete several steps simultaneously.

To consider the circumstance where stages could occur simultaneously, some concept of time needs to be incorporated into the pipeline. The technical process for including time in this pipeline is detailed in Appendix 3. This process places the pipeline against a timeline, which is defined by successive periods of one month. The subsequent exploration of how there is progress through the pipeline over timelines of differing lengths, shows how the stages of the same investment can be recorded in different periods. This will result in different investment values being observed across different data sources within the same period, despite recording the same investment.

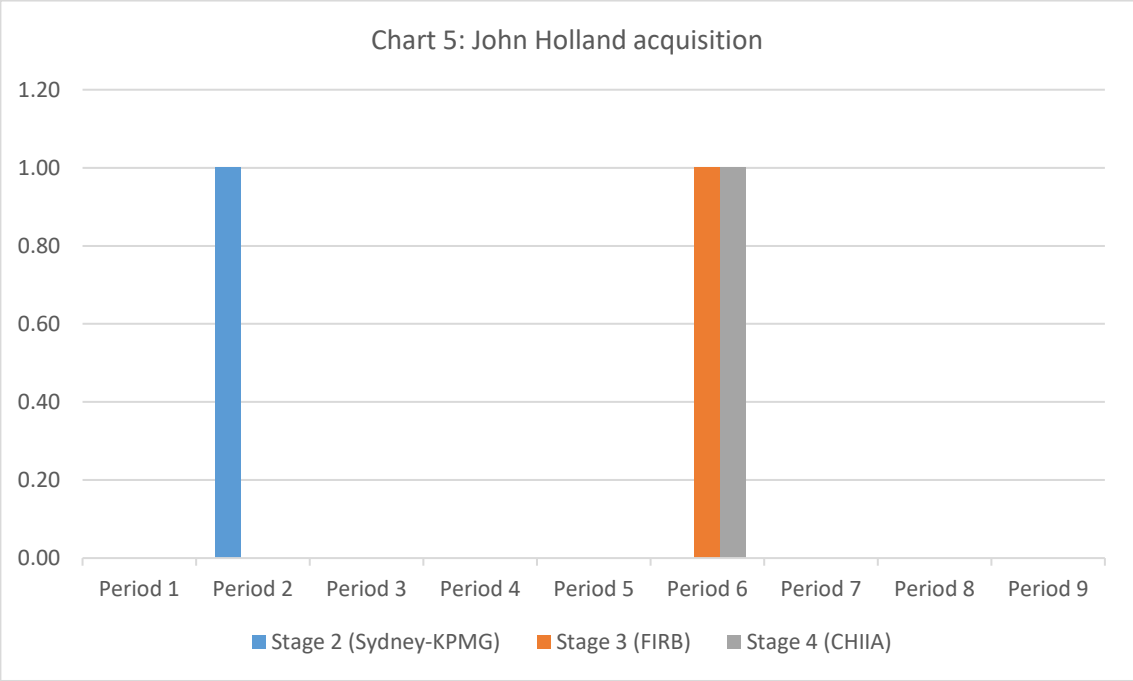
An example of this is the acquisition of a construction company — John Holland — by a Chinese firm. The agreement to acquire John Holland for approximately A$1 billion was publically announced by the parties in December 2014 (John Holland, 2014). Foreign investment approval was obtained in April 2015 , and the equity transaction was recorded as occurring in the same month. This

transaction in a pipeline without time, would have all sources recording the same value for this transaction, A$1bn, with that value linked to a non-time-dated stage (Table 6).

Table 6: John Holland acquisition in the pipeline model

Stage	**2**	**3**	**4**
Description	Agreement made to acquire equity holding in Australia	Approval/s acquired for equity investment	Equity holding acquired
Value ($A billions)	1.00	1.00	1.00
Date	December 2014	April 2015	April 2015
Period	1	5	5

Because the investment process took place over time, Sydney-KPMG, FIRB and CHIIA would record the investment in the period of the stage covered by the source. The investment value was recorded by Sydney-KPMG in December 2014, as this is when the deal was signed. This is denoted as occurring in Period 1, in Table 6. Equity investment approvals were received in April, which is four months after December, thus in period 6. The equity holding was also recorded by CHIIA as occurring in April, thus it is identified in period 6. These periods allow us to construct a timeline that can be represented graphically as shown in Chart 5.



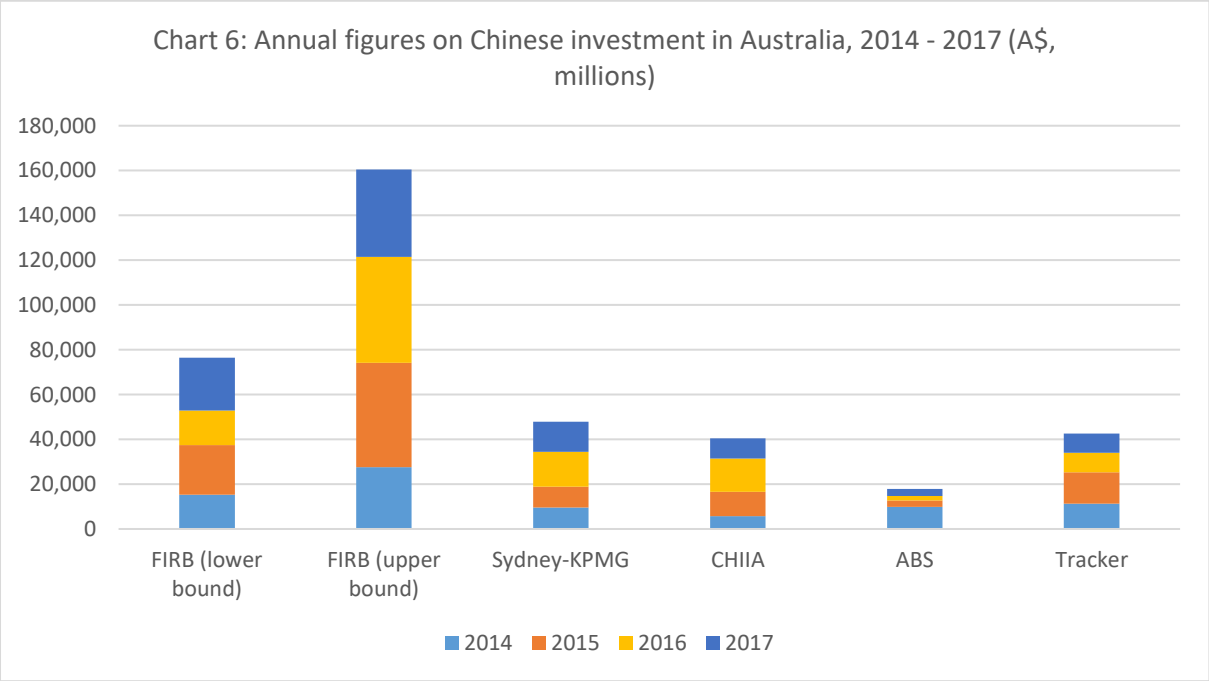
This example shows how the same investment can easily be recorded in different time periods by different data sources. This limits our ability to make year-by-year comparisons between some data — particularly when transaction-level data is not available. For example, comparing the Sydney-KPMG and CHIIA data for a given period requires assuming that all (or almost all) investments are

contracted and realised within the same period. That assumption may not be realistic, as illustrated by the John Holland acquisition example.
Where transaction-level data is available, this assumption can be tested. Even without this level of detail, comparisons can still be made between multiple years of data (which allows for some 'leakage' between single years).

II. D. Understanding the data that documents the Investment Pipeline

Establishing a clear understanding of the investment pipeline and how each section is related helps us understand what the different levels of investment reported by different sources may suggest about investment activity. Forming a clear understanding of how each source can be related, helps distinguish structural relativities from investment trends or extreme events.

The second, third and fourth expectations drawn from the pipeline can be applied to the available data[9]. Given the differences in the dating of transactions noted in the previous section, this comparison will be made using the aggregate figures[10] for the four years, 2014 to 2017. These are shown in Chart 6.



In the graph there are two FIRB figures. The FIRB (upper bound) figure is the value of all approved Chinese investment between 2013-14 and 2016-17. This figure is much larger than any other source. This suggests that there is a substantial amount of non-contracted approvals (approximately A$115 billion when compared to Sydney-KPMG). This FIRB (upper bound) figure includes real estate for residential purposes, which the other sources in this chart do not[11]. The FIRB (lower bound) figure is

[9] The first and fifth expectations stated cannot be applied because there is currently no measure of planned investment or follow-on investment approvals, respectively.
[10] All sources report for all years in Australian dollars, except Sydney-KPMG and the Tracker which report in American dollars. The Sydney-KPMG figures are converted using the yearly average exchange rate; the Tracker figures are converted using the monthly average exchange rate. Exchange rates were sourced from the Reserve Bank of Australia.
[11] All sources, including FIRB, include real estate purchased for commercial purposes.

provided to help adjust for this large difference in scope. This figure is calculated by subtracting the value of real estate approvals from total approvals, for Chinese investors. Given real estate (purchased for commercial purposes) is known to be a substantial component of the CHIIA, Sydney-KPMG and Tracker data, this should be considered a meaningful lower bound. This lower bound FIRB figure does suggest that the amount of non-contracted approvals is likely to be much lower than the amount suggested by the upper bound figure. The FIRB lower bound is just under A$35 billion larger than Sydney-KPMG.

Comparing the FIRB figures[12] with Sydney-KPMG, shown in Chart 6, confirms the second expectation from the investment pipeline. FIRB figures are much higher during this period than Sydney-KPMG, implying that the value of bids which do not result in signed contracts ('non-contracted approvals'), is higher than the value of deals not requiring approvals.

Comparing the FIRB figures with CHIIA, shown in Chart 6, confirms the third expectation from the investment pipeline. FIRB figures are substantially higher than CHIIA over this four year period. This suggests that the value of unrealised approvals is higher than the value of realised equity investments not requiring approval.

Comparing the Sydney-KPMG figures with CHIIA, also suggests the fourth expectation from the investment pipeline is confirmed, that is there are some equity deals which are signed but not realised. Sydney-KPMG figures are almost A$10 billion higher than CHIIA for this four year period. It was noted that this comparison only 'suggests' confirmation. This is because this difference should also include some measure of follow-on ('non-equity') investment, which Sydney-KPMG records but CHIIA does not.

This suggestion can be supported by exploiting a methodological difference between Sydney-KPMG and the Tracker. Sydney-KPMG is slightly higher than the Tracker. The difference between these two over the four-year period can also be interpreted (with caution) as an approximation of unrealised deals for equity and non-equity. Sydney-KPMG and the Tracker both track equity and non-equity deals, but the figures from Sydney-KPMG should include unrealised deals whilst the Tracker figures should not.

It was noted that this interpretation should be made with caution. This is because there are other differences in the scope of these sources. The Tracker only records investments worth U$100 million or more, whereas the University of Sydney-KPMG records investments worth A$5 million or more. This should mean that Sydney-KPMG figures are higher than the Tracker's. However, the Tracker includes debt and goes below the 10 per cent equity holding threshold used in the direct investment definition, which means that it may be higher in some years.

Using the ABS figure instead of CHIIA or the Tracker in the comparisons already made to the Sydney-KPMG and FIRB leads to the same broad conclusion. However, the ABS figure is notably lower than the CHIIA and Tracker figures. This may appear surprising given that in Table 1, the ABS figure is defined as the sum of equity holdings, follow-on investment and the change in value of direct investment entities. It is also net of outflows that come from these direct investment relationships and it does not include Chinese investment directed through third-party countries or external ports. Were the ABS just recording the same investments over this period as the Tracker, Sydney-KPMG and CHIIA, the results could suggest outflows are roughly equal to inflows.

[12] The FIRB data is the sum of the total figures for the financial years 2013-14 to 2016-17, as FIRB reports on financial not calendar years.

It is likely that the ABS is not recording the same transactions as the Tracker, Sydney-KPMG and CHIIA in their measure of Chinese investment, and in particular, the ABS figure does not cover all mainland China investment coming via other countries or territories. As noted, according to the ABS methodology, these would be measured as investment from those countries or territories, not mainland China. This suggests that the measured inflows being recorded by the ABS as coming from mainland China, would be lower than those being recorded by the Tracker, Sydney-KPMG and CHIIA.

The ABS also measures investment as being 'received' when it crosses an economic territory border. This inflow may include both the 'means to' and 'ends of' investment. An example of the 'ends of' investment is a company domiciled in China acquiring a stake in an Australian company, sending those funds directly from China to Australia. An example of the 'means to' investment, is that same Chinese company transferring the funds to its Australia-domiciled subsidiary, which then acquires the stake in the Australian company. The ABS record both flows as direct investment. By comparison, the Tracker, Sydney-KPMG and CHIIA only measure the 'ends of' investment. The two methods may often record the same values, but at different times and from different countries/territories of origin.

However, given the Tracker, Sydney-KPMG and CHIIA all records much higher figures than the ABS over this four year period, this suggests that a great deal of Chinese investment in Australia is being undertaken with funds directly transferred from other countries or territories or that some of this investment in being undertaken with funds sourced from Australia or another country.

All three reasons: the presence of outflows, the differences in geographic definitions and the source of funds not always aligning with the ultimate controller's nationality, can explain why the ABS figure is much lower than the Tracker, Sydney-KPMG and CHIIA. However, a more definitive explanation, including which explanations contribute most of this difference, would require transaction-level data by the actual source of funds.

The broad relationships observed between aggregate figures over the 2014 to 2017 period confirm the relevant expectations drawn from understanding the investment pipeline and data source definitions. In applying these conclusions to these data, several methodological differences have been highlighted which limit the extent of comparisons or raise further questions.

The next section discusses the methodological differences in detail and how they are observed in the data on 'equity holding acquired'. The next section also explains what CHIIA measures, how it differs to the other sources on equity holdings acquired and how it may answer some questions that we are raising about, but cannot answer with, the existing data.

II. E. CHIIA and other data sources that document 'Equity holding acquired'

There are three sources of data that document the 'equity holding acquired' section of the investment pipeline: the ABS, Tracker and CHIIA series.

Each measures this section of the pipeline differently. This section will explain the differences in each series' scope and methodological approach. This explanation seeks to reconcile the differences observed in the data.

Scope

Equity investment is one component of direct investment, as recorded by the ABS. Direct investment statistics also include debt and reinvested earnings within foreign direct investment relationships, however statistics that separate out some of these categories are available. The ABS collection covers transaction values of all sizes. A foreign direct investment relationship occurs when the foreign investor holds at least 10 per cent equity in the Australian entity. The statistics published on direct investment are annual aggregates and are net of outflows within these foreign direct investment relationships. (Note that foreign direct investment by Australia-based entities in mainland China-based entities are recorded separately as Australian foreign direct investment in China.)

The Tracker records new equity investment, debt and follow-on investment for transactions involving U$100 million or more. These figures only include inflows. The Tracker publically publishes transaction-level data.

CHIIA records the equity component of direct investment for transaction values of all sizes. CHIIA figures are gross and the data is published at the transaction-level.

Key methodological differences

There are two key methodological differences between these sources. These methodological choices are definitional. It is how each source defines whether investment is Chinese and when it occurs. While technical, these definitions are not trivial.

The 'geographic source of investment' defines whether or not investment is Chinese. The geographic source of investment can be defined in two ways. The first is 'immediate origin' which defines the source of investment being the external port or country that the funds directly came from. This is the definition used by the ABS. The second is 'ultimate origin' which defines the source of investment being the external port or country in which the funds are ultimately controlled. This is the definition used by the Tracker and CHIIA.

Chart 7: Directional flows of investment

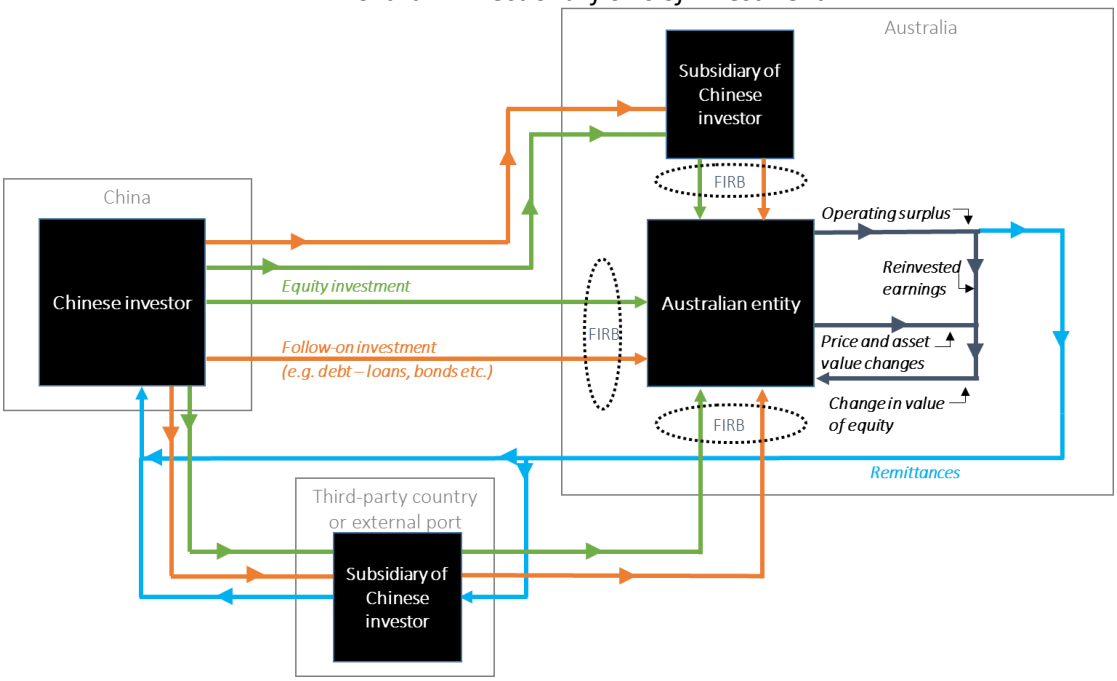


Chart 7 shows how investment funds flow between China, Australia and if applicable, a third-party country or external port. The ABS, using the 'immediate origin' definition only records those flows that directly connect the 'Chinese investor' to the 'Australian entity'. This includes equity investment, follow-on investment and remittances. If the Chinese investor sends the equity investment funds via the third-party country or territory, Singapore for example, then that is recorded as Singaporean investment in Australia by the ABS. The Tracker and CHIIA would record this investment as Chinese, because the funds are ultimately controlled by the Chinese investor.

This difference in definition implies that if there is any Chinese investment coming to Australia via a third-party country or territory, sources using the 'ultimate origin' definition will record more unique transactions as being Chinese than the ABS. The ABS should record all these transactions, but some will be labelled as investment from other countries or territories.

An important implication of these two definitions is that sources using the 'immediate origin' definition require investment to cross an economic territory border. Sources using the 'ultimate origin' definition do not. This means that the Tracker and CHIIA may record investment as occurring between the 'Subsidiary of Chinese investor' and the 'Australian entity'—if that is how the investment is undertaken. The ABS do not record any of these investments, in foreign investment or balance of payments statistics. However, the ABS may be recording these same investment values, but when the funds are transferred from the Chinese investor to its Australian-domiciled subsidiary. As noted in the previous section, this would cause differences in dating of the same investments, across sources.

If the funds used by the Australian subsidiary of the Chinese investor, do not come directly from mainland China, then the ABS would not record this as investment originating from China, unlike the Tracker and CHIIA.

This methodological difference is important because it clearly highlights the purpose of each series. The ABS is recording cross-border financial flows, which relate to direct investment activity. The Tracker and CHIIA, are recording the investment activity itself – regardless of how it was facilitated.

Chart 8: Key methodological differences in 'equity holding acquired' data sources

		Date of investment	
		Dated by **contracting**	Dated by **realisation**
Geographic source of investment	Source of investment by **immediate origin**	-	ABS
	Source of investment by **ultimate origin**	Tracker	CHIIA

The 'date of investment' defines when the source considers an investment has occurred. There are two ways to define the date of investment, as shown in Chart 8. The first is 'by date of contracting' which records investment as occurring when the agreement is made and announced. This definition is used by the Tracker. The second is 'by realisation' which defines investment as occurring when the legal ownership of the entity changes. This definition is used by the ABS and CHIIA.

This choice of definition has two effects. First, some investments will be recorded in different months. This will change the value of the transaction if converted into a currency other than A$ and the exchange rate changes between months. The Tracker data are recorded in US$.

Second, some investments will be recorded in different years. In addition to the exchange rate effects in consequence of being recorded in a different month, this will change the yearly aggregate values from each source.

This can have a substantial effect when a very large transaction (by value) is recorded in different years by different sources, due to this definitional difference. For example, the acquisition of John Holland for approximately A$1bn was announced in December 2014 (John Holland, 2014), and the Tracker records this in 2014. However, this investment did not receive the required equity approvals until April 2015 (Hockey, 2015), so the ABS and CHIIA record this investment in 2015.

The methodological gap filled by CHIIA

Chart 8 shows these two definitional differences overlaid and identifies the gap that CHIIA fills. Prior to CHIIA, the Tracker provided data on Chinese investment defined by ultimate origin, but not by realisation (and only for investments involving at least U$100 million). The ABS provided statistics on Chinese investment by realisation, but not by ultimate origin.

CHIIA fills this gap and provides data on Chinese investment by origin and by realisation. This gives the most complete picture of the China-Australia investment relationship by including all investments that are ultimately controlled by Chinese investors and defining those investments by the change in legal ownership.

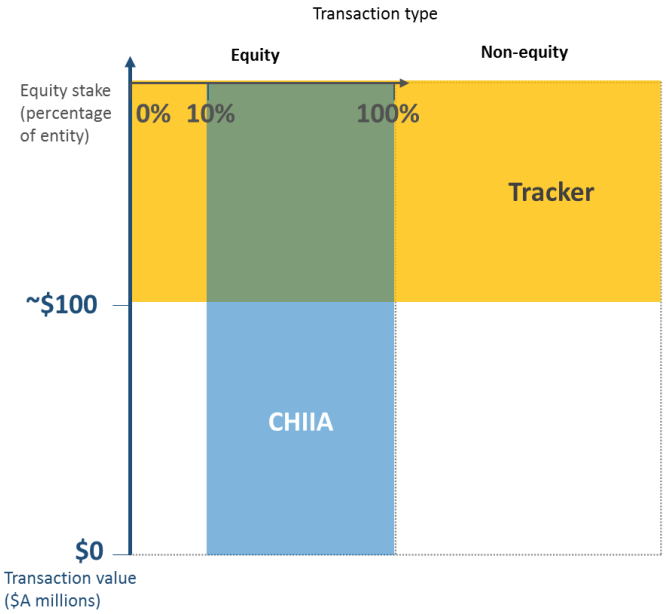
The information gap filled by CHIIA

CHIIA fills an informational gap by producing transaction-level data on Chinese investment in Australia that was not previously publically available. It adds to the transactions recorded by the Tracker through also including transactions involving values below US$100 million; and the ABS by publishing transaction-level data which is defined by ultimate origin. In this way, CHIIA adds to the data available for meaningful research on the China-Australia investment relationship.

The other gap filled derives from the scope and public nature of CHIIA. Prior to CHIIA, the only source of public transaction-level data was the Tracker. The Tracker only includes transactions involving US$100 million or more, whereas CHIIA includes transactions of all values. CHIIA not only defines the transactions recorded in Tracker in a way that is useful for the study of the China-Australia investment relationship, but it does this for the complete range of investments, not just the very large ones.

The focus on direct investment in CHIIA provides a more precise dataset for the Australian case with respect to this type of investment activity.[13] The Tracker's scope includes all non-bond investment, involving transactions over U$100 million. This includes the transactions that are recorded by CHIIA but also some follow-on investment (bundled into the same transaction value as the equity investment) and some debt. The difference in the scope of the two data series is illustrated in Chart 9. CHIIA's scope is shown in blue, and the Tracker's in yellow. The intersection is in green. If the sum of the yellow-only parts are greater than the only-blue part, then the Tracker will record more investment than CHIIA.

Chart 9: Scope of CHIIA and the Tracker



To illustrate the effect of the Tracker's different definition of investment and dating, a line-by-line comparison of the Tracker's 30 Australian transactions across 2014 and 2015 with CHIIA's equivalent data was constructed[14].

The Tracker's definition of investment is wider than CHIIA's, including all outbound non-bond investment. Apart from the equity investments that come under the standard IMF definition of

[13] As noted, CHIIA records new equity inflows relating to direct investment, using the same definition as the ABS and other statistical agencies using BPM6.
[14] For further information on this comparison please contact the author.

direct investment, the Tracker also includes equity investments with stakes under 10 per cent, debt and follow-on investment. The inclusion of debt results in the Tracker recording two additional transactions over this period: China Construction Bank's acquisition of an RBS loan book ($1.95 billion) and Yanzhou's purchase of convertible notes in its subsidiary Yancoal ($3.49 billion), which the Takeover Panel approved on the condition that the notes were never converted into equity.

The Tracker's inclusion of some follow-on investment results in one additional transaction being recorded. The follow-on investment in Western Australian-based V&V Walsh farms by JV partner Heilongjiang Grand Farm Group Limited.

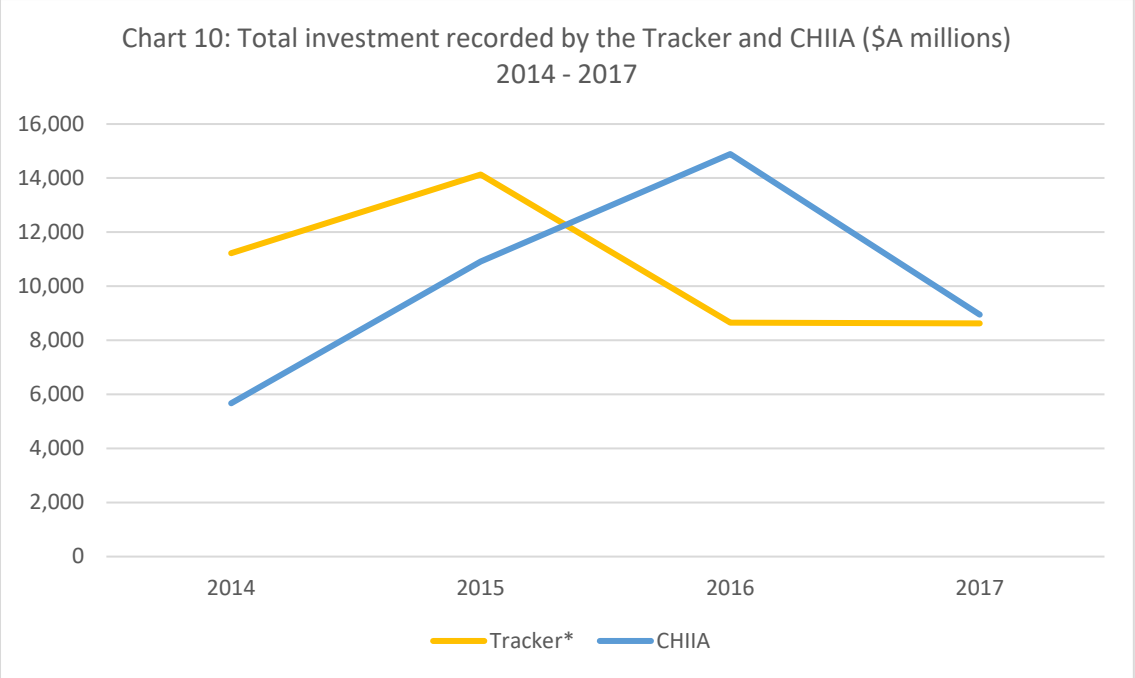
Non-equity investment is also bundled into direct investment transactions recorded by CHIIA, resulting in much higher transaction values reported by the Tracker. Five of the thirty transactions have a Tracker value that includes follow-on investment. The difference between these Tracker and CHIIA values amounts to $2.62 billion.

The different definition of dating (by announcement) to CHIIA's (by realisation) results in the Tracker's recording many transactions in different months or years. Of the thirty transactions, twelve were recorded in the same year but a different month, and eight were recorded in a different year. In total, 20 transactions were dated differently by the Tracker and CHIIA. For transactions that do not include follow-on investment, the different exchange rate means that the Tracker records A$92 million more than CHIIA. This exchange rate effect is likely higher, but it is difficult to extract this effect when follow-on investment is included given CHIIA currently has no comparison.

There are two transactions for which CHIIA records a much higher value than the Tracker. For the acquisition of Aquila Resources, CHIIA reports a transaction value A$267 million higher than the Tracker. For the acquisition of John Holland, CHIIA reports A$1.15 billion while the Tracker reports A$963 million. These are likely the difference between the transaction values that were announced and those reported at the time of realisation. Similarly, the Tracker includes the announced value of Fosun's investment in a JV with EG Funds Management. CHIIA records this transaction but does not include any transaction value. The only information available is the announced transaction value which appears to be the total return on investment that Fosun is forecast to receive, not the principal sum invested by Fosun.

The net of the differences reported in this comparison for the 2014 and 2015 data is A$8.39 billion. That is, the Tracker includes A$8.39 billion Chinese investment in Australia during 2014 and 2015, which CHIIA does not.

The Tracker and CHIIA comparison changes in 2016 and 2017. After 2015, CHIIA investment numbers continue to rise until peaking in 2016 and tapering off in 2017, as shown in Chart 10. The Tracker peaks in 2015, drops by almost half in 2016 and stays at that level in 2017. This is partly explained by CHIIA and the Tracker recording different investment – resulting in different aggregate figures. But the delayed peak in the CHIIA data is also the product of another methodological difference: how investments are dated. As noted in Chart 8, the Tracker dates investments by date of contracting, while CHIIA dates by date of realisation. For transactions which are recorded by both sources, CHIIA will typically record the same investments at a later date.



III. What does CHIIA data tell us about Chinese investment in Australia, that we didn't know before?

CHIIA data currently tells us how much Chinese direct investment (by origin) was realised between 2014 and 2017. It adds to the information base by:

- Covering all direct investment transactions, rather than limiting coverage by a cut off value as adopted by the Tracker and other sources
- Focuses on direct investment transactions by adopting the ABS standard definition of a direct investment relationship
- Records transactions as closely as possible to the time of realisation
- Distinguishes between the equity and non-equity components of direct investment

Prior to CHIIA, the total value of Chinese direct investment in Australia during this period was said to be A$18 billion, according to the ABS. The Tracker provided data that defined Chinese by ultimate origin, which raises this total to A$42.6 billion. While the Tracker does have a much broader scope than direct investment, its data are provided at the transaction-level which allows researchers to identify and remove those investments which fall outside the scope of their research. Still, no transaction-level data on investments (by any definition) involving less than US$ 100 million has formerly been publically available. That meant no transaction-level data was publically available for 79 per cent of the equity investments for this four year period, according to CHIIA data.

Including smaller investments affects our understanding of Chinese investment, beyond simply by counting a greater number of investments. If the nature of small investments (below US$100 million) is different from that of large investments (at least US$100 million), only having data on large investments provides a skewed understanding of the China investment relationship with Australia.

One of the simpler ways to consider the nature of this investment is to look at the receiving sector. Table 8 shows the difference in the percentage of investment received by each sector, per year. The values are the percentage points difference between the share of investment that sector received

for large investments (at least A$100 million), and the share received for small investments (less than $A100 million). These differences show us how different the distribution of investment for large compared to small investments is across sectors. Take mining as an example. In 2014, Mining received 0.13 percentage points more of large investments compared to its share of small investments[15].

Table 8: Different in percentage point shares by industry within year for large and small investments

	2014	2015	2016	2017
Agriculture, Forestry and Fishing	- 0.10	- 0.14	- 0.05	- 0.02
Mining	0.13	0.08	0.11	0.51
Manufacturing	- 0.06	0.17	- 0.00	- 0.01
Electricity, Gas, Water and Waste Services	-	- 0.00	0.23	0.05
Construction	- 0.12	0.01	- 0.03	-
Wholesale Trade	-	- 0.01	-	-
Retail Trade	-	-	-	0.03
Accommodation and Food Services	0.18	- 0.07	- 0.03	- 0.02
Transport, Postal and Warehousing	0.13	0.05	0.24	-
Information Media and Telecommunications	0.18	-	-	-
Financial and Insurance Services	- 0.00	- 0.01	-	-
Rental, Hiring and Real Estate Services	- 0.33	- 0.10	- 0.49	- 0.51
Professional, Scientific and Technical Services	-	-	- 0.04	- 0.07
Administrative and Support Services	-	0.01	-	- 0.12
Public Administration and Safety	-	-	-	-
Education and Training	- 0.06	- 0.00	- 0.00	-
Health Care and Social Assistance	-	0.02	0.05	0.18
Arts and Recreation Services	-	- 0.02	0.01	-
Other Services	0.04	-	-	- 0.00

KEY

Direction of change	-				+		
Magnitude of change (percentage points)	50	10	5	0	5	10	50

The coloured cells in the table act as a 'heat map', highlighting the magnitude of difference between the distributions by investment scale. Over one-third of these cells are coloured, meaning over one-third of industry shares per year are more than five percentage points different across the large and small transaction distributions. The number and magnitude of these differences suggest that small transactions are different from large transactions, beyond the size of investment. Now that public, transaction-level data exists for these small transactions, the differences between the two can be identified clearly and analysed carefully.

[15] Tables with the share of investment received per sector, by size of transaction, are in Appendix 5

CHIIA provides a source of high-quality transaction-level data that aligns with data from official sources such as the ABS, while resolving the problems associated with recording by 'immediate origin' rather that 'ultimate origin'.

Transaction-level data gives insight into how and when this investment occurs. This provides researchers with the material to better explain why this investment occurs. The 'why' explained by research can help policymakers better understand the impact of prevailing policy and how different policies might affect Chinese investment in Australia.

Appendix I – complete table of investment pipeline cases

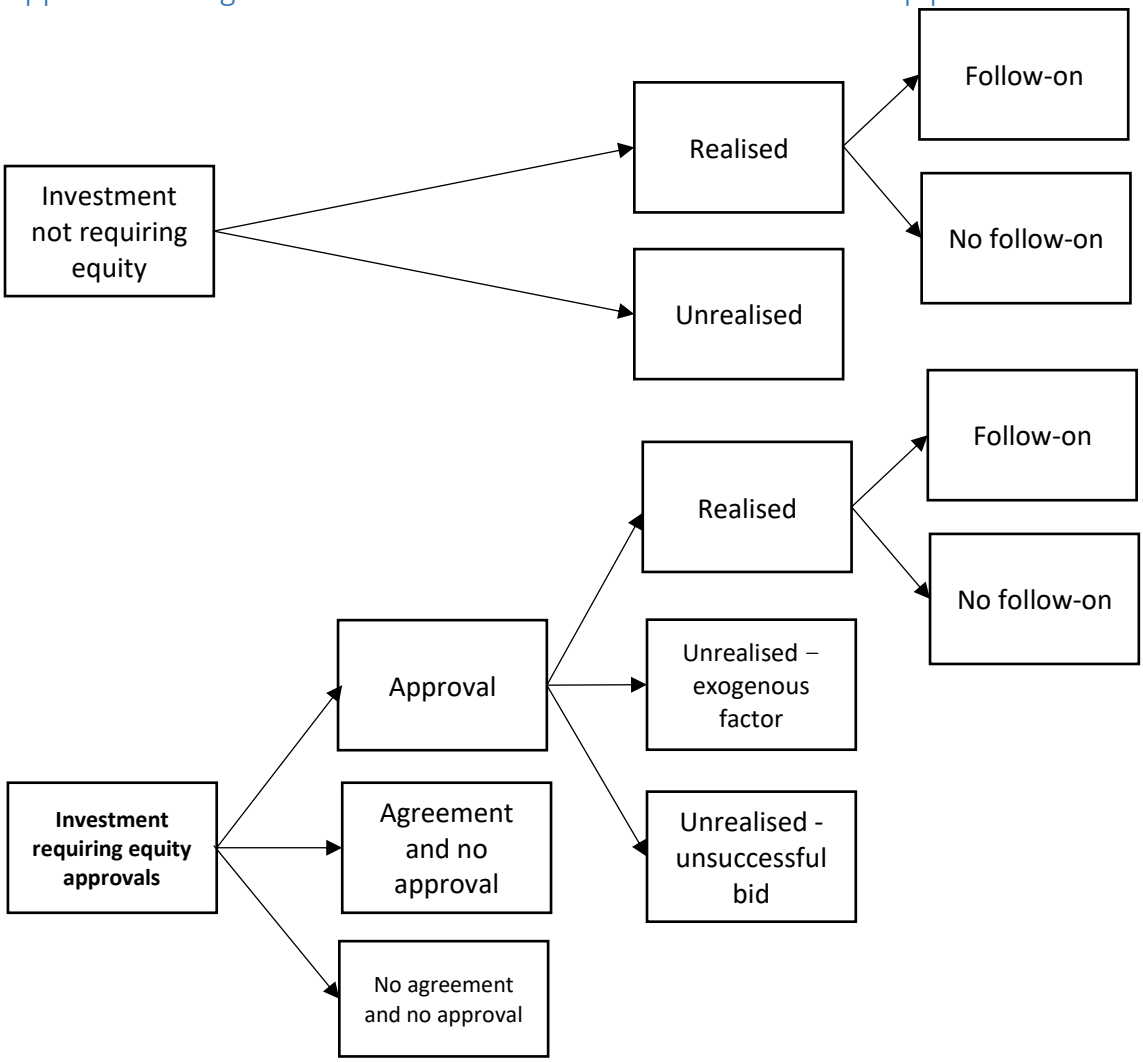
Case #	Table no.	Cases	1	2	3	4	5	6
N/A [16]	Table 2	**Investment requiring equity approvals**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
		Investment not requiring equity approvals	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
a	Table 3	**Investment requiring equity approvals–agreement and no approval**	Planned investment	Agreement made to acquire equity holding in Australia				
b		**Investment requiring equity approvals–no agreement and no approval**	Planned investment					
c	Table 4	**Unrealised investment not requiring equity approvals**	Planned investment	Agreement made to acquire equity holding in Australia				
d		**Unrealised investment requiring equity approvals–exogenous factor**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment			

[16] These two cases are repeated later as cases f and h

e		**Unrealised investment requiring equity approvals–unsuccessful bid**	Planned investment		Approval/s granted for equity investment			
f	**Table 5**	**Investment requiring equity approvals (with follow-on)**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
g		**Investment requiring equity approvals (no follow-on)**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired		
h		**Investment not requiring equity approvals (with follow-on)**	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding
i		**Investment not requiring equity approvals (no follow-on)**	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired		
j	**Table 6**	**Investment requiring equity approvals with large follow-on investment**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Large follow-on investment in entity of equity holding
k		**Investment requiring equity approvals with small follow-on investment**	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Small follow-on investment in entity of equity holding

l		**Investment not requiring equity approvals with large follow-on investment**	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Large follow-on investment in entity of equity holding
m		**Investment not requiring equity approvals with small follow-on investment**	Planned investment	Agreement made to acquire equity holding in Australia		Equity holding acquired	Approval/s granted for follow-on investment	Small follow-on investment in entity of equity holding

Appendix 2 – logic of cases considered in versions of investment pipeline



Appendix 3 – adding time into the investment pipeline

To consider if stages could occur simultaneously, some concept of time needs to be incorporated into this pipeline. The activity described in each stage is measured upon completion of the described activity. The time when a stage occurs will be denoted t_i, with the subscript indicating the stage. This notation is connected to the established pipeline in Table 9.

Consecutive stages do not necessarily occur in consecutive time periods. Rather,

Table 9: The investment pipeline and occurrence of each stage

Stage	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Occurrence	t_1	t_2	t_3	t_4	t_5	t_6	t_7
Description	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s granted for equity investment	Equity holding acquired	Approval/s granted for follow-on investment	Follow-on investment in entity of equity holding	Change in value of entity

$$t_2 = t_1 + m_2$$
$$t_3 = t_2 + m_3$$

and so forth. Where m_i is the time taken to complete stage i, measured from the completion of stage $i - 1$. While expressed in months, the value of m_i could be a year or more (i.e. 12+ months).

The smallest commonly observed period of time across all sources of data that document this pipeline (i.e. lowest common denominator) is one month. Therefore, the independent timeline that this pipeline will be placed against, will be defined in periods of one month.

If two actions occur and are completed within one month, these would be deemed to occur 'simultaneously' for the purpose of the investment pipeline. If, for instance, Stages 1 and 2 occur within the same month, the pipeline would appear as in Table 10.

Table 10: A simple example of simultaneity

Timeline	**Period 1**	**Period 2**	**Period 3**	**Period 4**
Occurrence	t_1, t_2	t_3	t_4	t_5

Given all other activity remains constant in relative terms, there is an implicit assumption of impatience. That is, when a given stage of a pipeline is completed, the subsequent stages will be completed as per the defined m for those stages. Simultaneity does not create 'gaps' in the pipeline, it moves the entire pipeline forward.

To understand the impact of simultaneity on aggregate investment values, the value recorded at each stage needs to be defined. These definitions, linked with the established pipeline, are shown in Table 11.

Table 11: Investment values associated with each stage

Stage	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Description	Planned investment	Agreement made to acquire equity holding in Australia	Approval/s acquired for equity investment	Equity holding acquired	Approval acquired for follow-on investment	Follow-on investment in entity of equity holding	Change in value of entity
Value	$e_1 + f_1$	e_2	e_3	e_4	f_5	f_6	x

Where *e* represents equity investment (positive), *f* represents follow-on investment (positive), *x* represents the marginal change in value of the entity (positive or negative).

The subscript number refers to the stage associated with that value. Not all types of values are relevant to all stages, e.g. there is no f_2, by the definition of this pipeline. A few initial assumptions about these values:

1. e_1, f_1 are assumed to be upper bounds, the maximum amount that could be spent (at period 1 prices). The budget constraint is therefore assumed to be hard – though this may not always be the case in reality due to price and other valuation changes. Two implications of this assumption:
    a) $e_1 \geq e_2 \geq e_3 \geq e_4$
    b) $f_1 \geq f_5 \geq f_6$
2. Any simultaneity of values does not change the size of the values

Greater nuance in the assumptions 1a and 1b will be added in the applications of simultaneity to the established cases of the pipeline.

To understand what is possible to define in the abstract, the implicit assumptions made in a very simple case will first be explored. Table 12 explains the action that is completed in each period and the associated notation in brackets. Completion of these actions is denoted t_i, where *i* is the stage number.

Table 12: Pipelines for investment depending on requirements for equity approvals (repeat of Table 2)

Timeline	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Investment requiring equity approvals	Investment is planned (t_1)	Agreement is made to acquire equity holding in Australia (t_2)	Approval/s have been received for equity investment (t_3)	Equity investment is realised (t_4)	Approvals have been received for follow-on investment (t_5)	Follow-on investment is realised (t_6)
Investment not requiring equity approvals	Investment is planned (t_1)	Agreement is made to acquire equity holding in Australia (t_2)	Equity investment is realised (t_4)	Approvals have been received for follow-on investment (t_5)	Follow-on investment is realised (t_6)	

Note: The base unit is month (one month = 1), with the timeline starting at 0, when t_1 occurs.

The simplest representation of Table 2 is shown above in Table 11. Each stage occurs in a separate time period, with consecutive stages occurring in consecutive time periods. In constructing this pipeline, a few additional assumptions have been made:

1. Each stage is one month long: $m_{i,c} = 1, \forall i, c$
2. There is no simultaneity – stages all occur in separate months
3. There are no delays – stages occur in consecutive months
4. Investors are impatient – in the case of 'investment not requiring equity approvals', because stage 3 is not required, the investor then 'skips' to stage 4 immediately on completion of stage 2.

Assumption (1) can be modified to allow for three possible ranges of values for m:

a) The entire pipeline will occur within one month: $\sum_i m_{i,c} < 1 \ \forall c$
b) There will be less than one month between each stage, that is, there are no delays: $1 \leq \sum_i m_{i,c} < 4 \ \forall c$
c) There will be more than one month between stages, that is, there will be delays: $4 \leq \sum_i m_{i,c}$

Furthermore, the length of a stage, *m,* can vary based on two attributes: the stage and the case.

- The length of each stage is different ($m_{i,c} \neq m_{j,c} \ \forall \ i \neq j$. Relaxing this assumption slightly allows each stage to have a different length — probably the most realistic assumption.
- The length of a stage is different for each case: $m_{i,c} \neq m_{i,d} \ \forall \ c \neq d$

Assumption (2) can be modified to allow for three forms of simultaneity:

a) Maximum simultaneity – all stages occur within one period
b) Minimum simultaneity – each stage occurs in a different period
c) Intermediate simultaneity – all stages occur in a pipeline longer than that of maximum simultaneity, and shorter than that of minimum simultaneity. [17]

These forms of simultaneity coincide with the three possible ranges of values for *m*. The two concepts can be reconciled as follows:

a) Maximum simultaneity occurs when $\sum_i m_{i,c} < 1$
b) Intermediate simultaneity occurs when $1 \leq \sum_i m_{i,c} < 4$
c) Minimum simultaneity occurs when $4 \leq \sum_i m_{i,c}$

The pipeline for a specific transaction can only take on one form of simultaneity at one time. However, if the value of *m* changes then the form of simultaneity may also change. To illustrate how this pipeline is altered by a change in *m*, an example has been constructed.

Two scenario pipeline example

There are two scenarios in this example. In both scenarios, the length of all stages, except for stage 3, is 0.1 months ($m_{i,c} = 0.1 \forall i \neq 3$). In the first scenario, the length of stage 3 is one month ($m_{3,c} = 1$). In the second scenario, the length of stage 3 is five months ($m_{3,c} = 5$). It is assumed that the value of *m* does not change across cases (for different *c*).

For a limited set of cases (a,b,f,g,h,i)[18], the pipelines under Scenario 1 are shown in Table 13.

To show how these pipelines were constructed, case f will be used as an example.

t_1 occurs at the beginning of period 1 (when time = 0).
$t_2 = t_1 + m_2 = 0 + 0.1 = 0.1 \Rightarrow$ t_2 occurs in period 1.
$t_3 = t_2 + m_3 = 0.1 + 1 = 1.1 \Rightarrow$ t_3 occurs in period 2.
$t_4 = t_3 + m_4 = 1.1 + 0.2 = 1.3 \Rightarrow$ t_3 occurs in period 2.
$t_5 = t_4 + m_5 = 1.3 + 0.2 = 1.5 \Rightarrow$ t_3 occurs in period 2.
$t_6 = t_5 + m_6 = 1.5 + 0.2 = 1.7 \Rightarrow$ t_3 occurs in period 2.

This process is replicated for all cases. The pipelines under scenario 2 are shown in Table 14.

[17] Note that there is no limit on the length of the pipeline, though in application there is likely some limit to the feasibility of endlessly pursuing an investment. This suggests that a limit on the length of the pipeline would occur prior to Stage 4, this is accounted for cases of the pipeline in which the equity holding is not acquired (cases a,b,c,d,e,) in Appendix I

[18] See Appendix I for a full list of cases

Table 14: Scenario 2 – the investment pipeline when the length of stage 3 is five months

Case #	Timeline	Period 1: $t \in [0, 1)$	Period 2: $t \in [1, 2)$	Period 3: $t \in [2, 3)$	Period 4: $t \in [3, 4)$	Period 5: $t \in [4, 5)$	Period 6 : $t \in [5, 6)$	Period 7 : $t \in [6, 7)$
a	**Investment requiring equity approvals – agreement and no approval**	t_1, t_2						
b	**Investment requiring equity approvals – no agreement and no approval**	t_1						
f	**Investment requiring equity approvals (with follow-on)**	t_1, t_2					t_3, t_4, t_5, t_6	
g	**Investment requiring equity approvals (no follow-on)**	t_1, t_2					t_3, t_4	
h	**Investment not requiring equity approvals (with follow-on)**	t_1, t_2, t_4, t_5, t_6						
i	**Investment not requiring equity approvals (no follow-on)**	t_1, t_2, t_4						

To clearly define the impact of changing *m* on the value of investment recorded in each period, the values of each period (as defined in table 8) are substituted in. This results in the following aggregate investment values being recorded in each period, under each scenario.

The difference between the approvals process taking one or five months results in the recording of the approval value, the values of the approved equity acquisition and follow-on investment being delayed from period 2 to period 6. The same amount of investment occurs in both scenarios, but in different periods.

Table 15 states the total investment recorded at each stage and shows the difference caused by the delay. This table uses the values attributed to each stage of investment, defined in table 8.

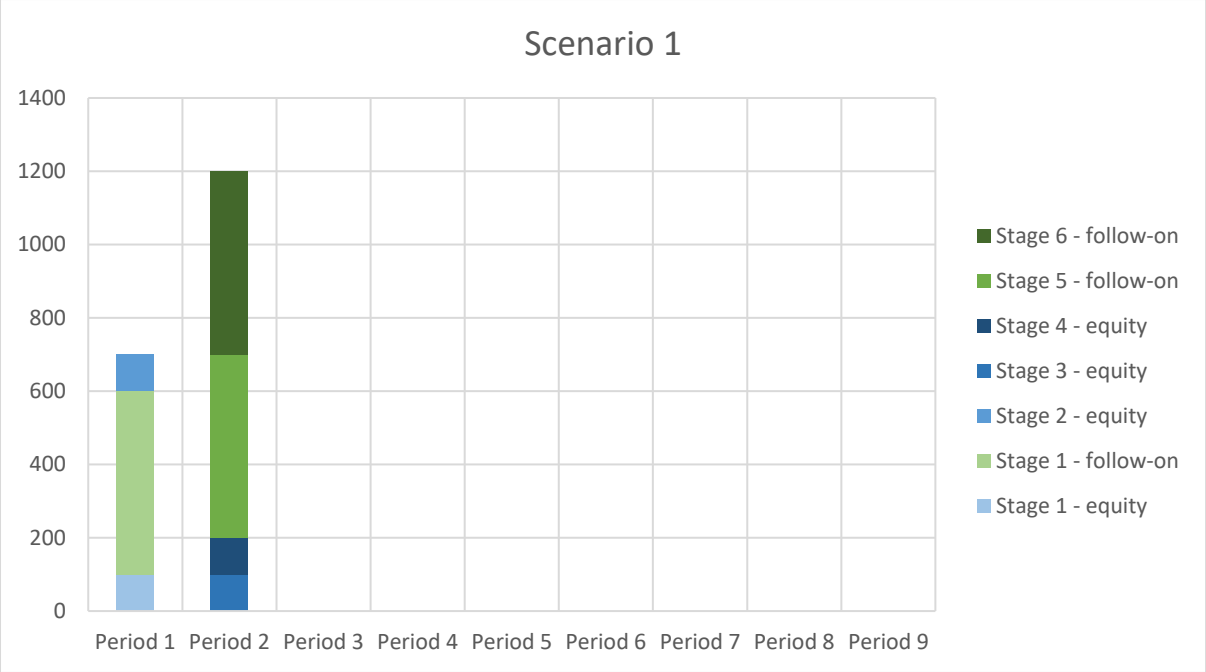
Table 15: Total investment values recorded at each stage under scenarios 1 and 2

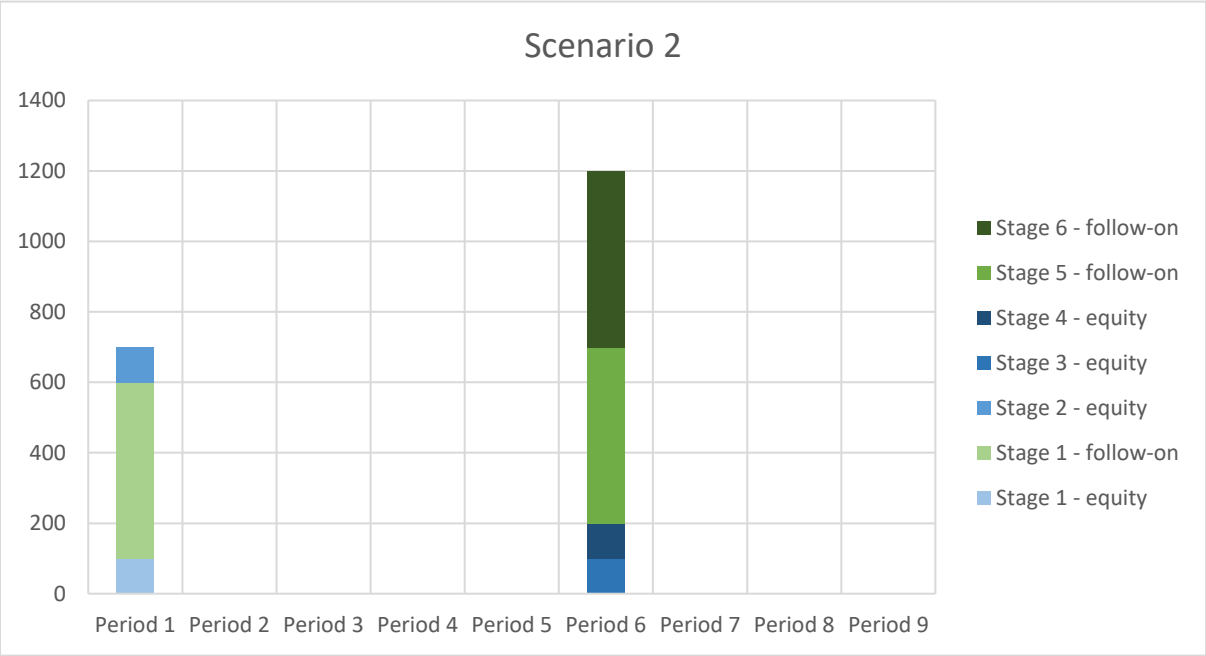
	Period 1: $\boldsymbol{t} \in [\mathbf{0}, \mathbf{1})$	**Period 2:** $\boldsymbol{t} \in [\mathbf{1}, \mathbf{2})$	**Period 3:** $\boldsymbol{t} \in [\mathbf{2}, \mathbf{3})$	**Period 4:** $\boldsymbol{t} \in [\mathbf{3}, \mathbf{4})$	**Period 5:** $\boldsymbol{t} \in [\mathbf{4}, \mathbf{5})$	**Period 6** : $\boldsymbol{t} \in [\mathbf{5}, \mathbf{6})$	**Period 7** : $\boldsymbol{t} \in [\mathbf{6}, \mathbf{7})$
Scenario 1	$6(e_1 + f_1) + 5e_2 + 2e_4 + f_5$	$2(e_3 + f_3) + 2e_4 + f_5 + f_6$	0	0	0	0	0
Scenario 2	$6(e_1 + f_1) + 5e_2 + 2e_4 + f_5 + f_6$	0	0	0	0	$2(e_3 + f_3) + 2e_4 + f_5 + f_6$	0
Difference (Scenario 1 – Scenario 2)	-	$-(2(e_3 + f_3) + 2e_4 + f_5 + f_6)$	-	-	-	$2(e_3 + f_3) + 2e_4 + f_5 + f_6$	-

The notional values listed in Table 15 can be shown in a graph[19], with a few additional assumptions:

- Perfect certainty – planned investment is equal to approved and realised investment (for both equity and follow-on investment)
- All approvals are necessary
- Equity investment = $100
- Follow-on investment = $500

[19] These graphs were created using the basic investment pipeline model in the attached Excel spreadsheet





To this point in the discussion, it has been assumed that the size of investment values is the same for all cases. Delays in investment could affect when the investment is recorded across sources. It may also affect the investment itself, e.g. impact of changes in exchange rates.

There are two further complications that may change the effect of delays on the aggregate data. First, if delays are more common for large-value investments, then the effect on the aggregate values recorded by data sources will be commensurately larger. The reverse is true for smaller transactions. Second, the effect of delays will change the likelihood of investment being realised if earlier stages are so drawn out as to make the process unfeasible for the investor.

Observable pipelines

To understand how the abstract notion of this pipeline is captured in the data sources, the requirements for observing pipelines within and across years for single sources will be stated. Further, the requirements for observing pipelines within and across years for multiple sources will be stated.

The sources to be discussed are CCPIT, FIRB and CHIIA, which record data on planned, approved and realised equity investments, respectively. All three sources report on a yearly basis, which means that any pipeline that occurs within 12 months will be captured within one dataset. However, CCPIT and CHIIA report on calendar years, whereas FIRB reports on financial years. For any pipeline, in which t_3 occurs in period 7, the approval will be recorded in a latter year of the financial year, than the planned investment. Six more periods later, results the approval being recorded in the subsequent year. For any pipeline in which t_4 occurs six periods later, the equity acquisition will be recorded in the latter year of the financial year, than the planned investment. Six period more results in the equity acquisition being recorded in the subsequent year.

None of these sources currently record multiple sections of the pipeline, therefore there is no need to consider how pipelines may move across years within single sources. This assertion should be re-evaluated if the nature of these sources change.

Application of the investment pipeline

This pipeline provides a structure to explain why a single transaction may be recorded by different data sources, in different periods of time. This concept also suggests that this pattern of recording is different, for different cases of transactions. If there is more than one case of transactions, then this pipeline (in the abstract) cannot conclusively explain how time affects differences in aggregate figures across data sources. However, if data can be matched across sources, even for limited cases, then the value of m for these cases could be estimated. If some values for *m* are known, this could start to expla

Appendix 4 – CHIIA 2014 sectoral breakdown by transaction size

Table 16: Sectoral breakdown for large transactions

	2014	2015	2016	2017
Agriculture,_Forestry_and_Fishing	-	0.01	0.06	-
Mining	0.37	0.13	0.15	0.57
Manufacturing	-	0.17	-	0.05
Electricity,_Gas,_Water_and_Waste_Services	-	-	0.25	0.06
Construction	0.03	0.13	-	-
Wholesale_Trade	-	-	-	-
Retail_Trade	-	-	-	0.04
Accommodation_and_Food_Services	0.18	0.06	-	0.02
Transport,_Postal_and_Warehousing	0.18	0.05	0.30	-
Information_Media_and_Telecommunications	0.18	-	-	-
Financial_and_Insurance_Services	-	-	-	-
Rental,_Hiring_and_Real_Estate_Services	0.02	0.41	0.10	0.08
Professional,_Scientific_and_Technical_Services	-	-	0.02	-
Administrative_and_Support_Services	-	0.01	-	-
Public_Administration_and_Safety	-	-	-	-
Education_and_Training	-	-	-	-
Health_Care_and_Social_Assistance	-	0.02	0.10	0.18
Arts_and_Recreation_Services	-	-	0.01	-
Other_Services	0.04	-	-	-

Table 17: Sectoral breakdown for small transactions

	2014	2015	2016	2017
Agriculture,_Forestry_and_Fishing	0.10	0.15	0.11	0.02
Mining	0.23	0.05	0.04	0.06
Manufacturing	-0.06		0.00	0.05
Electricity,_Gas,_Water_and_Waste_Services	-	0.00	0.02	0.01
Construction	0.15	0.12	0.03	-
Wholesale_Trade	-	0.01	-	-
Retail_Trade	-	-	-	0.01
Accommodation_and_Food_Services	-	0.13	0.03	0.04
Transport,_Postal_and_Warehousing	0.05	-	0.06	-
Information_Media_and_Telecommunications	-	-	-	-
Financial_and_Insurance_Services	0.00	0.01	-	-
Rental,_Hiring_and_Real_Estate_Services	0.35	0.51	0.59	0.60
Professional,_Scientific_and_Technical_Services	-	-	0.06	0.07
Administrative_and_Support_Services	-	-	-	0.12
Public_Administration_and_Safety	-	-	-	-
Education_and_Training	0.06	0.00	0.00	-
Health_Care_and_Social_Assistance	-	-	0.05	-
Arts_and_Recreation_Services	-	0.02	-	-
Other_Services	-	-	-	0.00

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