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Disentangling the Effects of Polycrisis and Policy Changes Shaking the Austrian Housing Market: Pandemic, Tightened Bank Lending Criteria and Inflation

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Motivation

- How to **holistically** measure the effects of **(macro)economic shocks *not* origin within the housing market** on a **country's housing market**?
- Depending on the **type of shock**, either the **supply or the demand side** are expected to react **first**
- Some crises or events are expected to have an **immediate impact** while others likely **evolve gradually**
- Which **housing market data** should best be use to study such **complex implications** holistically?

Framework

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  - **prices** versus **quantities**
  - **immediate** versus **gradually evolving** effects
  - led by the **supply** versus the **demand** side

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- For that, we estimate **hedonic price** and (quasi-hedonic) **quantity** models
  - **Hedonic price model:** estimation of a hierarchical model to account for the large geographical heterogeneity of housing markets
  - **Quasi-hedonic count model:** estimation of a count model (Negative Binomial fits best!) that models the number of transactions again accounting for location

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- To differentiate between supply- and demand-side effects, we use data that proxies the agent that moves first
  - **Advertisements** (A)**:** Immediate Effects led by the Supply Side
  - **Notary Deeds** (D)**:** Delayed Effects reflecting joint Demand- and Supply-Side effects
  - Intermediate **"Brokered Advertisments"** (use of a marker set for an advertisement by real estate agents in their Austria-wide database once a property is brokered) (A^B): Timely effects reflecting joint Demand- and Supply-Side effects

Real Estate Data

- Data pool collected by **Data Science Service GmbH**
  - Use of **brokers' database** reporting advertised (A) and final (A^B) prices and all standard hedonic controls as well as the flag when/whether the property was sold
  - These data come with rich set of **hedonic controls** and amended details from official statistics
- **Notary Deeds:** (D) "Grundbuch" incl. date of transaction (date of signing the contract), price and location

Which (Macro-)Shocks Hit the Austrian Housing Market?

- The **pandemic**: restrictions, uncertainty and change of tastes
- **Inflation and Interest Rate Hikes**
  - Cost-of-living issues: **income effects** and
  - Interest Hikes (Monetary Policy Actions) -> Expensive Mortgages (**wealth and income** effects)
    Credit Channel and **Balance Sheet Channel**
- Tightening of **Bank Landing Standards**: Loan-to-value restrictions (**wealth effect**), Mortgage Duration (**age effect**), Income-to-Instalment Restrictions (**income effects**)

Models

- Separate Models for **Price and Quantity** Effects
- Depending on the hypothesis tested: models are fed with the most appropriate **data** and effects are estimated as **gradual** or **immediate** effect
- Various **"crises proxies"** (normative and positive) added for identifying the additional effects

	Event	Description	Type	Source
Lockdowns	Pandemic	Timing of lockdowns	N	RIS
Mobility	Pandemic	Mobility related to workplace travel	P	Google Mobility Data
Incidence Rate	Pandemic	Confirmed COVID cases	P	Austrian Federal Ministry of Social Affairs, Health, Care and Consumer Protection
Policy Enactment	Bank-Lending Standards	Timing of enactment	N	RIS
New loans	Bank-Lending Standards	Volume of new loans to households for housing purposes	P	OeNB & ECB
Inflation	Inflation	Changes in the national consumer price index	P	OeNB & ECB
Mortgage Interest Rates	Inflation	Changes in average lending rates for new mortgages	P	OeNB & ECB
EURIBOR	Inflation	Changes in the 3 months Euro Interbank Offered Rate	P	European Money Markets Institute
Policy Rate	Inflation	Hikes in the ECB policy rate	N	ECB

Hedonic Pricing Model implemented as Hierarchical Model

Model framework

Hierarchies based on Austrian administrative divisions

1. Individual apartments/houses level (i)
   $\log p_{ids} = \beta_{0ds} + \mathbf{X}_{1ids}\beta_1 + \varepsilon_{0ids}$ with $\varepsilon_{0ids} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ids}})$,
2. District level (d)
   $\beta_{0ds} = \beta_{0s} + \mathbf{X}_{2ds}\beta_2 + \varepsilon_{0ds}$ with $\varepsilon_{0ds} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ds}})$,
3. Federal state level (s)
   $\beta_{0s} = \beta_0 + \mathbf{X}_{3s}\beta_3 + \varepsilon_{0s}$ with $\varepsilon_{0s} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0s}})$.

This set-up collapses to the single model equation

$$\log p_{ids} = \beta_0 + \mathbf{X}_{1ids}\beta_{1ds} + \mathbf{X}_{2ds}\beta_{2ds} + \mathbf{X}_{3s}\beta_3 + \varepsilon_i,$$

with $\varepsilon_i = \varepsilon_{0ids} + \varepsilon_{0ds} + \varepsilon_{0s}$ and $\varepsilon_i \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ids}} + \sigma^2_{\varepsilon_{0ds}} + \sigma^2_{\varepsilon_{0s}})$.

β_{0ds} and β_{0s}: random intercepts; ε_{0ds}, ε_{0ds}: random/group-level effects; $\sigma^2_{\varepsilon_{0ds}}$, $\sigma^2_{\varepsilon_{0s}}$: between-unit variances

Count Model for Quantity Effects

Negative binomial regression model

- **Number of transactions** y as response variable with pdf

$$f(y;\mu,\theta) = \frac{\Gamma(y+\theta)}{\Gamma(\theta)\cdot y!}\cdot\frac{\mu^y\cdot\theta^\theta}{(\mu+\theta)^{(y+\theta)}}$$

- **Independent variables:** Housing type (apartment, one-family house), time dummies, location (federal state, urban/rural classification), seasonal effect

Some Hypotheses and Test Results

- We develop **6 hypotheses** – two per "event": price and quantity effects
- Supplemental **event-specific** hypotheses
- We specify for each hypothesis, **which data source** proxies the channel best – who are the **leading agents**?
  – each with various predictions
- I show today a selection of results – **work in progress!**

Pandemic

Hypothesis (Pandemic Quantity Effects)

Quantity effects, in general comprehensively measured by (D), triggered by dampened economic activity are expected to vary over time in the following way:

1. *During the* ***initial general lock-down*** *following the break-out of the COVID-19 pandemic, the sudden slow-down of all human interactions is expected to lead to a significant* ***shrinkage of successfully transacted dwellings****.*
2. ***Legally binding*** *restrictions on human interactions are always expected to lead to a slow-down of housing sales. Yet, the* ***adaptation of business modalities*** *to a "new normal" means a* ***weaker response to following periods of restrictions****.*
3. *An observable* ***decrease of mobility*** *also means a* ***slow-down of selling- and buying activities****. Adaption of business strategies to the new setting also means a weaker response to reduced mobility over time.*
4. *The slow-down of all human interactions is expected to have a* ***weaker effect on advertisements*** *in the short-run. Yet,* ***delays in construction and general interactions*** *necessary to conclude housing transactions are expected to occur with a* ***positive time-lag****.*

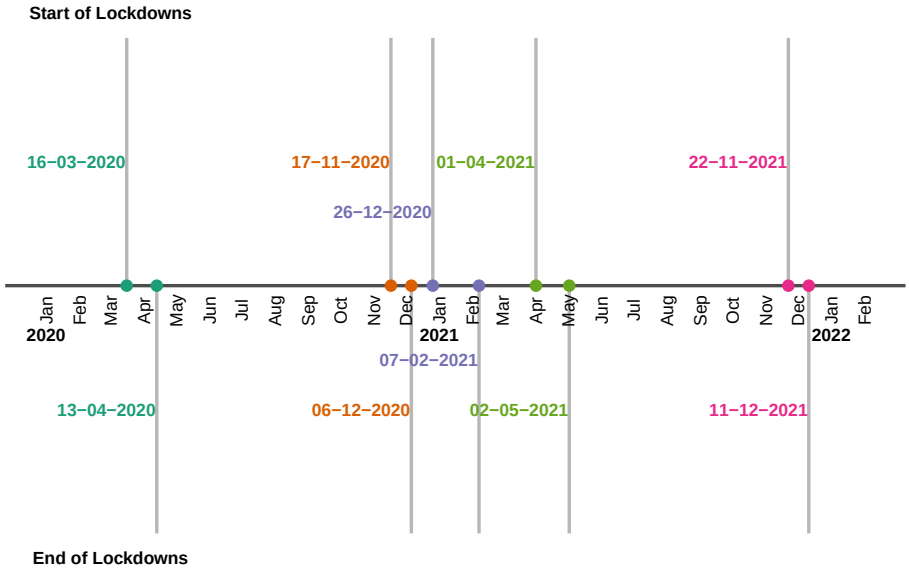
Pandemic

Hypothesis (Pandemic Price Effects)

We distinguish between ***immediate and gradual*** *price effects representing a* ***slow-down of economic activity*** *and a* ***shift of preferences****, respectively. Effects are expected to differ between* ***types of properties*** *and thus are best measured using* (A) ***and*** (A^B)*. We expect*

1. ***price drops*** *during periods of* ***restrictions*** *or* ***low economic activity****. The severity of such drops* ***diminishes over time****.*
2. ***gradually increasing*** *relative prices for properties offering* ***open space amenities****.*
3. ***gradually increasing*** *relative prices for properties in* ***non-urban areas****.*
4. *gradually decreasing relative prices for* ***studios and micro-apartments****.*

Timing of Lockdowns



COVID-19 quantity effects (Deeds)

	Response: Count	
1st Lockdown	-0.58^{***}	-0.57^{***}
	(0.04)	(0.04)
2nd Lockdown		-0.16^{***}
		(0.05)
3rd Lockdown		-0.30^{***}
		(0.04)
Regional lockdown (B,W,N)		0.01^{*}
		(0.05)
4th Lockdown		-0.17^{***}
		(0.05)
Observations	7 482	7 482
AIC	126 757	126 695

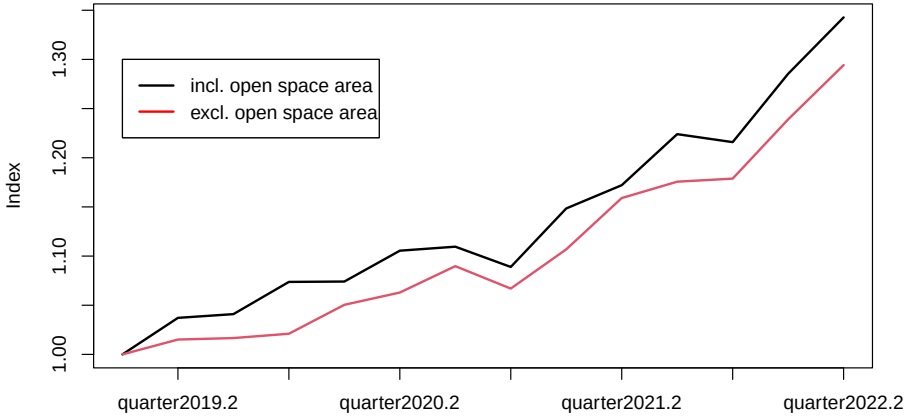
Effects of COVID-19 Lockdowns on House Prices (Adverts)

	Response: *Price (log)*		
All Lockdowns	-0.020^{***}		
	(0.004)		
1st Lockdown		-0.063^{***}	-0.063^{***}
		(0.009)	(0.009)
2nd Lockdown			-0.028^{**}
			(0.009)
3rd Lockdown			0.003
			(0.008)
Regional Lockdowns			-0.007
			(0.009)
4rd Lockdown			-0.008
			(0.010)
Housing characteristics	✓	✓	✓
Time Variable	✓	✓	✓
Location Fixed Effects	✓	✓	✓
Location Random Effects	✓	✓	✓

Effects of COVID-19 on Urban and Rural Areas (Adverts and Deeds)

	Response: *Price (log)*	
	(1) Adverts	(2) Deeds
Urban	0.002	0.032***
	(0.007)	(0.008)
COVID-19	−0.042**	0.050**
	(0.013)	(0.018)
Urban × COVID-19	−0.014*	−0.035***
	(0.006)	(0.007)
Housing characteristics	✓	✓
Time Variable	✓	✓
Location Fixed Effects	✓	✓
Location Random Effects	✓	✓
Number of observations	51 353	29 791
Adj. R^2 (marginal)	0.747	0.702
Adj. R^2 (conditional)	0.822	0.785

COVID Price Effect: Marginal Effect of Properties w/ Open Space



Effects of Mobility Reduction and COVID-19 Deaths on Prices

Adverts

	Response: *Price (log)*	
Reduced Mobility (Normalised)	-0.060^{***}	
	(0.011)	
New COVID-19 Related Deaths (Normalised)		0.008
		(0.027)
Housing Characteristics	✓	✓
Time Variable	✓	✓
Location Fixed Effects	✓	✓
Location Random Effects	✓	✓
Number of observations	32,750	32,750
Adj. R^2 (marginal)	0.740	0.742
Adj. R^2 (conditional)	0.826	0.825

Notes: Reduced time period for model including mobility data due to lack of data availability: 26 Feb 2020 - 28 Feb 2022

Inflation and Interest Hikes

- Inflationary period starting in mid-2021 meant both, a **tighter budget** for consumers but also a **general more pessimistic economic outlook**
- Tighter budget: employers do **not** have to **immediately adjust wages** (not like in Luxembourg) but only **once per year** following several round of **sector-specific collective bargaining** ("Sozialpartnerschaft")
- **Average CPI-inflation over the *past* 12 months** acts as a **benchmark**
- Effective a **loss in purchasing power** with every additional month the current inflation rate exceeds wage increases in the same month

Inflation and Interest Rates Hikes

Hypothesis (Inflation and Interest Rates Hikes Quantity Effects)

Effects are expected to be visible with a time-lag due to a lag of direct information on changes in buyers' behaviour. We rely again on (D) yet expect changes to be evolve with a lag. Concretely, we expect

1. ***delayed and gradually evolving drops** in concluded transactions.*
2. *that declines are negatively lagged-correlated with **changes in the consumer price index**.*
3. *that declines are negatively lagged-correlated with **interest rate hikes** by the ECB.*

Inflation and Interest Rates Hikes

Hypothesis (Inflation and Interest Rates Hikes Price Effects)

Effects are expected to be visible with a ***time-lag*** *due to a lag of direct information on* ***changes in buyers' behaviour****. We thus rely, as a second-best option, on* (A^B) *yet expect changes to be visible with a lag. Concretely, we expect*

1. *delayed and gradually evolving* ***stagnation or even drops in prices****.*
2. *that declines are* ***negatively lag-correlated*** *with changes in the* ***consumer price index****.*
3. *that declines are* ***negatively lag-correlated with interest hikes*** *by the ECB.*

Less ability and less willingness to engage in large investments

- Increasing the cost-of-borrowing hampers housing investments. Well documented **bank lending channel** and **balance-sheet (or credit) channel** (Iacoviello and Minetti, 2008).
- Supported by survey evidence:
  Austrian Corona Panel Project (ACPP) reported by Resch and Ausserladscheider, 2022: Between October 2021 and March 2022 the **share** of people stating a **negative outlook increased by 25pp from** 37% to 62%.
- Severe gradual **slow-down of transactions**: number of notary deeds and brokered advertisements dropping
- **Prices** are **gradually decreasing** – both advertised and final prices

Inflation and Interest Rates Hikes Price Effects (A^B)

	Response: *Price (log)*	
Interest Rate (New Mortgages) (3 months lag)	-0.066^{*} (0.029)	
Interest Rate (New Mortgages) (6 months lag)		-0.142^{***} (0.043)
Housing characteristics	✓	✓
Time Variable	✓	✓
Location Fixed Effects	✓	✓
Location Random Effects	✓	✓
Number of observations	37,158	37,158
Adj. R^2 (marginal)	0.701	0.701
Adj. R^2 (conditional)	0.783	0.783

Bank Lending Standards

KIM-VO Regulation

The **Kreditinstitute-Immobilienfinanzierungsmaßnahmen-Verordnung (KIM-VO)** requires

(i) a maximum mortgage **duration** of 35 years,

(ii) a maximum **loan-to-value ratio**[a] (LTV) of 80%, and

(iii) a maximum **debt-service ratio**[b] (DSR) of 40%.

Regulation announced: December 2021
Regulation enacted: August 2022

[a] The loan-to-value ratio is defined as the amount borrowed relative to the value of the property purchased.

[b] The debt-service ratio is defined as the monthly amount of debt service payments (interest plus plus amortisations) relative to disposable household income.

Bank Lending Standards

Hypothesis (Bank-Lending Standards Quantity Effects)

Tightened requirements to obtain a mortgage mean that ***the group of buyers eligible for a mortgage*** *financing the purchase* ***shrinks****. This concerns both, potential buyers lacking* ***sufficient wealth*** *to meet the LTV requirements,* ***sufficient income*** *meeting the DSR requirements or older people. Thus,* (A^B) *and* (D) *are expected to* ***gradually fall****. As stricter lending standards set an* ***upper limit to prices affordable*** *to prospective buyers means more* ***crowding out*** *in* ***higher price segments*** *and* ***fewer transactions*** *when* ***moving up the price distribution****.*

Bank Lending Standards

Hypothesis (Bank-Lending Standards Price Effects)

Price effects triggered by changes in enforced bank landing standards are the consequence of crowding-out effects: A ***smaller number of actors is bidding*** *for dwellings. Further, price pressure is shifted:* ***the more expensive a dwelling the fewer bidders****.*
This ***shift in the market power of the demand side*** *mechanically leads to*

1. *a* ***gradual decrease in prices*** *measured via* (A) *and* (A^D)*.*
2. *a* ***gradual but more pronounced decrease of prices in higher price segments****.*

Results Bank Lending Standards

This is work in progress!

Conclusions I

- **Model Framework** to identify the impact of different housing-external shocks on the housing market
- **Price** and **Quantity** Models
- Feed models with **advertisement**, **brokered advertisements**, or **notary deeds** to measure through which side of the market the effect evolves
- Form **hypotheses** how several external shocks should impact the market and test them using the corresponding model (quantities, prices) and data

Conclusions II

- **Findings:**
  - Pandemic: **Short-term negative effect** of **first lockdown** on real estate prices in Austria
  - **Timing of first lockdown** as well as changes in **mobility** explain short-term dynamics of real estate price developments
  - Pandemic: Immediate **recovery** and price increases **above pre-COVID-19 trend level**
  - Pandemic: Prices of properties **in rural areas** and with access to **open space** experienced a **larger increase**
  - Pandemic: **Quantities drop** with the first lockdown and **remained at a lower level** ever since then
  - BLS: Prices decrease gradually – identified via **timing of the policy**
  - BLS: **Heterogeneity analysis** under construction...
  - Inflation & Interest Hikes: **Sentiments** indicate quite pessimistic outlook
  - Inflation & Interest Hikes: **Credit channel and balance sheet channel** predict decreases in prices – confirmed again

Iacoviello, M., & Minetti, R. (2008). The credit channel of monetary policy: Evidence from the housing market. *Journal of Macroeconomics*, *30*(1), 69–96.

Resch, T., & Ausserladscheider, V. (2022). Inflation expectations and economic outlook in Austria since the beginning of the pandemic [Accessed: November 2023].